D) AMENDMENTS TO THE DRAWINGS

None.

E) REMARKS

This supplemental Response is filed in response to the Advisory Action dated June 7, 2006 in which the Response to the Final Office Action dated April 17, 2006, which Response being filed on June 1, 2006 was not entered as it was the Examiner's position that the Affidavit provided with the Response failed to provide a showing of good and sufficient reasons why the Affidavit was not presented earlier.

Entry of this supplemental Response and Affidavit supplemented by experimental results are requested in addition to the Response and Affidavit filed on June 1, 2006. Upon entry of this supplemental Response, claims 1-26 will be pending in this Application.

In the outstanding Office Action, the Examiner rejected claims 1-2, 4, 6-10 and 12-13 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer; rejected claims 3 and 5 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer and Driver (Great Britain Patent No. GB 2,060,436); rejected claim 11 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer and applied to claim 9, and further in view of Vakil (U.S. Patent No. 5,407,705); rejected claim 14 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer as applied to claim 9, and further in view of Eppler; rejected claim 15 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer as applied to claim 1, and further in view of Demaray (U.S. Patent No. 4,676,994); rejected claim 16 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer as applied in claim 1, and further in view of Rigney et al. (U.S. Patent No. 6,455,167); and rejected claims 17 and 18 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer as applied to claim 1 and further in view of

Demaray (U.S. Patent No. 4,676,994) and Rigney et al. (U.S. Patent No. 6,455,167); rejected claims 19 and 20 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer as applied to claim 1, and further in view of Tecle (U.S. Patent No. 5,922,403); rejected claims 21-23 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer as applied to claim 1, and further in view of Akechi (Japanese Publication JP60081892A); and rejected claims 24-26 under 35 U.S.C. 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647), Kirk-Othmer, Demaray (U.S. Patent No. 4,676,994), Rigney et al. (U.S. Patent No. 6,455,167) and Eppler.

Rejection under 35 U.S.C. 103

A. Claims 1-2, 4, 6-10 and 12-13

The Examiner rejected claims 1-2, 4, 6-10 and 12-13 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) hereafter referred to as "Nagaraj et al." in view of Klabunde (U.S. Patent No. 4,877,647) hereinafter referred to as "Klabunde" and further in view of Kirk-Othmer.

Specifically, the Examiner stated that

> Nagaraj et al. teaches a method of applying a heat reflecting on a nickel-based superalloy component of a gas turbine engine by applying a ceramic thermal barrier coating onto the substrate by plasma spraying and then applying the heat reflecting layer of gold or platinum on the thermal barrier coating (Col. 3, line 26-Col. 4, line 24). It is the examiners position that the ceramic thermal barrier coating dries prior to application of the heat reflective coating. Nagaraj et al. does not teach the claimed method of applying the heat-reflecting layer. However, Nagaraj et al. teaches that the heat-reflecting layer can be applied by any conventional deposition technique (Col. 3, lines 49-57). Klabunde teaches forming a reflective metal layer, such as a gold or platinum layer, on a substrate by forming a dispersion of metal particles and organic solvent carrier, applying the dispersion to a substrate and then heating/firing to form the metal layer, where the dispersion can be applied by spraying (Col. 3, lines 35-65; Col. 6, lines 30-54).
>
> Nagaraj et al. in view of Klabunde does not teach the spraying is an air assisted spraying technique. However, using air to atomize and project a spray for coating a substrate is well established in the art, as shown by Kirk-Othmer. (see

page 672, Table 1, page 68e, Table 2), and hence would have been an obvious method of spraying the heat-reflective coating because of the expectation of successfully forming the reflective layer. In addition, it is the examiners position that the application method taught by KirkOthmer are "capable" of being applied at the claimed conditions and such a recitation does not require such temperature and pressure during the application of the coating mixture.

It would have been obvious to one of ordinary skill at the time of the invention was made to apply the heat reflective layer of Nagaraj using conventional spraying as taught by Klabunde and specifically the conventional air-assisted spraying as disclosed by Kirk-Othrner because of the expectation of successfully applying the heat reflective layer on a gas turbine engine.

Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach the claimed amount of reflective coating mixture and thermal barrier coating applied to the substrate. However, it is the examiners position that the amount of these coatings applied to the turbine component are known result effective variables, as not enough of these coatings applied to the component would not provide the desired heat reflectance and thermal barrier properties, and too much would not offer additional benefits of increased heat reflectance and thermal properties.

Therefore, it would have been obvious to one skilled in the art at the time of the invention was made to determine an optimal coating amount for the heat reflective layer and the thermal barrier layer, in the process of Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer, through routine experimentation, to provide the desired heat reflecting and thermal barrier properties for the turbine component.

The Examiner further states in the Response to Arguments (see pages 2-3 of the outstanding Office Action):

The applicant has argued against the Nagaraj reference stating the present invention does not include a barrier coating, which is deposited by the techniques as disclosed at column 4, lines 15-16 and one would be motivated to deposit the reflective coating on the substrate by such methods. The examiner respectfully disagrees. Nagaraj explicitly discloses any conventional methods for depositing the reflective coating and 'conventional methods" is not limited to methods disclosed for another materially different coating. The examiner notes the claim only requires the presence of the steps listed and does not limit the claim to exclude any other steps, which may include a thermal barrier coating as taught by Nagaraj or any other process steps.

The applicant argues against the Nagaraj reference stating that since Nagaraj discloses applying a TBC by method outside the scope of the invention and only discloses 'conventional deposition techniques" for the reflective coating, such techniques logically being the same. The examiner respectfully disagrees that the teachings of Nagaraj naturally flow that the apparatus and method for

coating for the two subsequent coatings are "logically" the same and cannot find evidence to suggest such. Argument's arguments must be considered mere attorney speculation not supported by evidence. *In re Scarborough,* 500 F.2d 560,566 182 USPQ 298,302 (CCPA 1974).

The applicant has argued against the Klabunde reference stating that it does not teach the use of a palladium, platinum, and/or gold coating as a "reflective coating". Klabunde is utilized here to show a known method of applying a metal coating on a substrate includes forming substrate, and finally heating/firing to form the metal layer (Col 3, lines 35-65; Col 6, lines 30-54).a dispersion of metal particles and organic carrier, spraying the dispersion to the

The applicant argues against the Kirk-Othmer publication stating that the context of the Kirk-Othmer reference is directed toward internal workings of gas turbine engine and fails to teach heat-reflective coatings can be applied by spraying techniques. The examiner respectfully disagrees. The Kirk-Othmer publication, as a whole, is directed to known and conventional spraying techniques and discloses, on page 688 in Table 2, air-atomizing sprays is a known method of spraying coatings. Therefore, the Kirk-Othmer publication, reasonably suggests to one of ordinary skill in the art to utilize air-assisted spraying to coat a substrate. *Nagaraj discloses applying a noble metal coating onto a gas turbine substrate by any conventional method, Klabunde discloses applying a noble metal by using a dispersion of a noble metal and organic by spraying and KirkOthmer discloses air-assisted spraying is conventionally utilized in coating a substrate.* Therefore, it would have been obvious to one of ordinary skill at the time of the invention was made to apply the heat reflective layer of Nagaraj using conventional spraying as taught by Klabunde and specifically the conventional air-assisted spraying as disclosed by Kirk-Othmer because of the expectation of successfully applying the heat reflective layer coating on substrate.

The applicant has argued against the Kirk-Othmer reference stating that it does not teach any method for coating the surface of a gas turbine engine. While the examiner agrees Kirk-Othmer does not explicitly state coating the surface of a gas turbine engine, *Nagaraj teaches coating, by a conventional method, a noble metal onto the surface of the gas turbine engine, Klabunde discloses noble metals are conventionally spraying onto surfaces to coat them, and Kirk-Othmer teaches conventional methods of coating substrates includes air-assisted spraying.* Therefore the examiner is not asserting that Kirk-Othmer directly teaches coating a gas turbine engine, only that they teach conventional spray coating methods and one of ordinary skill in the art would reasonably expect success in coating a turbine blade with an air assisted process.

The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller,* 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Applicants respectfully traverse the rejection of claims 1-2, 4, 6-10 and 12-13 under 35 U.S.C. § 103(a).

The following principle of law applies to all Section 103 rejections. MPEP 2143.03 provides "To establish prima facie obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F2d 981, 180 USPQ 580 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970)." [emphasis added] That is, to have any expectation of rejecting the claims over a single reference or a combination of references, each limitation must be taught somewhere in the applied prior art. If limitations are not found in any of the applied prior art, the rejection cannot stand. In this case, the applied prior art references clearly do not arguably teach some limitations of the claims.

Claim 1 recites a method of applying a heat-rejection coating, comprising the steps of: supplying a metallic component of a gas turbine engine; providing a reflective-coating mixture, wherein the reflective-coating mixture comprises a metallic pigment and a reflective-coating-mixture carrier; applying the coating mixture to a surface of the component by a method selected from the group consisting of air-assisted spraying, airless spraying, brushing, and decal transfer, each of the group being capable of being applied at ambient room temperature and not requiring the component to be disposed inside a chamber having a pressure level less than ambient pressure level; and firing the component surface having the reflective-coating mixture thereon to form a reflective coating on the component. (Emphasis added).

Nagaraj, as understood, is directed to metal articles and protective layers that are applied to a metal article. Nagaraj has no teaching of a method for applying a reflective-coating mixture. Nagaraj teaches that his mixtures "can be readily deposited" (col. 3, line 60) and mentions "conventional deposition techniques" (col. 3, line 56), but gives no teaching of a specific approach. However, Nagaraj does disclose application techniques for applying a preferred barrier coating which are nitrides and oxides, such as alumina (AL_2O_3) and yttria-stabilized zirconia. Suitable techniques for applying the barrier layer include chemical and physical vapor deposition (CVD and PVD), electroplating and plasma spray techniques which are known in the art. (See col. 4, lines 10-24)

Applicants would like to respond to the Examiner's statements contained in the Response to Arguments: (see pages 2-3 of the outstanding Office Action)

> The applicant has argued against the Nagaraj reference stating the present invention does not include a barrier coating, which is deposited by the techniques as disclosed at column 4, lines 15-16 and one would be motivated to deposit the reflective coating on the substrate by such methods. The examiner respectfully disagrees. Nagaraj explicitly discloses any conventional methods for depositing the reflective coating and 'conventional methods" is not limited to methods disclosed for another materially different coating. The examiner notes the claim only requires the presence of the steps listed and does not limit the claim to exclude any other steps, which may include a thermal barrier coating as taught by Nagaraj or any other process steps.

Applicants note that the Examiner concedes Applicants' above characterization of Nagaraj as it was not disputed in the "Response to Arguments" in the present Office Action. Applicants assert that Nagaraj teaches away from the present invention. First, the present invention recites applying the reflective coating mixture to a surface of the metallic gas turbine engine component, not applying a thermal barrier coating to a surface of the metallic gas turbine engine component and then applying a reflective coating over the thermal barrier coating. Second, since none of the coatings in Nagaraj is applied by previously identified methods as recited in claim 1, the amount applied may differ from previous application techniques. Further, the only deposition methods taught in Nagaraj for applying the barrier layer are chemical and physical vapor deposition (CVD and PVD), electroplating and plasma spray techniques. See col. 4, lines 15-18. These processes are specifically not within the scope of the present invention as claimed because they require complex deposition apparatus, and/or special chambers, and limit the size of the articles that may be coated. See paragraphs [0014] and [0037] of the present specification. As discussed in the present application, factors such as expense of the equipment required and size limitations of the article to be coated are significant factors as to how one of ordinary skill in the art would consider trying to deposit a reflective coat onto a ceramic outer surface of a gas turbine component. In Nagaraj, the thermal barrier coat is applied prior to the applying the reflective coat. The thermal barrier coat is deposited by methods which are specifically outside the scope of the present invention, due to the special apparatus and chambers

required. The subsequent reflective coat is applied by unnamed "conventional deposition techniques," such techniques logically being the same apparatus and chambers already available to apply the thermal barrier coat. Since the present invention recites specific deposition techniques, none of which are disclosed or suggested by Nagaraj, with none of the deposition techniques taught by Nagaraj being available to one practicing the present invention, due to the limitations of the Nagaraj techniques, Nagaraj necessarily teaches away from the present invention.

Further, the present invention specifically discloses that a "[The] ceramic barrier coating, where used, is preferably applied by air-assisted spraying a ceramic-barrier coating mixture onto the surfaces of the component, although airless and high volume low pressure (HVPL) methods have also been demonstrated, (see para [0013]) and that "[t]he reflective coating, similar to the ceramic coating, is preferably applied by air-assisted spraying, although airless, HVLP, brushing and decal transfer methods have been demonstrated." (see para [0014]) (emphasis added). In other words, in the present invention, the claimed techniques apply not only for the reflective coating, but also to the ceramic barrier coating. Nagaraj also discloses a ceramic barrier coating similar to the present invention, but Nagaraj disclosure appears limited to chemical and physical vapor deposition (CVD and PVD), electroplating and plasma spray techniques. The techniques disclosed by Nagaraj are specifically absent from claimed deposition methods in claim 1, for the reasons previously discussed. The present invention discloses applying both ceramic barrier coating and reflective coating by the claimed techniques of air-assisted spraying, airless spraying, brushing, and decal transfer. Each of these techniques are applied with less expensive equipment and facility requirement than chemical and physical vapor deposition (CVD and PVD), electroplating and plasma spray techniques identified in Nagaraj. If the techniques of air-assisted spraying, airless spraying, brushing, and decal transfer were actually "conventional deposition techniques" as referred to in Nagaraj, such techniques would have been identified in Nagaraj.

As further evidence that air-assisted spraying, airless spraying, brushing, and decal transfer are not "conventional deposition techniques", Applicants direct the Examiner to the

attached Declaration under 37 C.F.R. §1.132 executed by Andrew J. Skoog, the first named inventor of the present invention. Mr. Skoog, who certainly qualifies as one having ordinary skill in the art has certified to the following:

> I have observed differences in durability of a reflective coating applied over a substrate of superalloy and titanium materials when the reflective coating is applied by methods consisting of air-assisted spraying, airless spraying, brushing and decal transfer, when compared to other application methods. These differences in durability include enhanced inhibition of the reflective coating to erosion, corrosion and diffusion into the substrate of superalloy and titanium materials.
>
> I have observed differences both in the duration and the magnitude of temperature that can be withstood by a reflective coating applied over a substrate of superalloy and titanium materials when the reflective coating is applied by methods consisting of air-assisted spraying, airless spraying, brushing and decal transfer, when compared to other application methods. These differences include the reflective coating having the capability not only to withstand higher temperatures, but also to withstand those higher temperatures for durations exceeding that of reflective coatings applied by different methods.
>
> I have observed the ability of a reflective coating applied over a titanium material by methods consisting of air-assisted spraying, airless spraying, brushing and decal transfer to then successfully pass certain test procedures used to measure for stress corrosion cracking in the titanium material.
>
> I have not observed the ability of a reflective coating applied over a titanium material by methods other than air-assisted spraying, airless spraying, brushing and decal transfer to then successfully pass the test procedures used to measure for stress corrosion cracking in the titanium material that were alluded to in [the previous paragraph].
>
> Included with this Declaration are Figures 1 and 2, based on testing conducted in August 2006. Both figures relate to a coupon composed of Inconel 625 over which is applied, by sputter coating, a layer of a reflective coating mixture. Sputter coating is an application technique used for applying a reflective coating mixture over a superalloy previous to the use of application techniques of the present invention. Figure 1 shows the hemispherical reflectance properties for reflectance angles of 10, 30, 50 and 70 degrees on the coated coupon. Figure 2 shows the significant reduction of reflectance properties that result from the coupon being subjected to a 1,400°F environment for only one hour. In contrast, Figure 11, which was filed in the present application and was exposed to a 1,600°F environment for 50 hours, retained a significantly improved

> hemispherical reflectance over all angles. This is shown at 50 degrees in the filed application.
>
> It is my belief, based on at least these observations, including test results as shown in Figures 1 and 2, that application of a reflective coating over superalloy or titanium materials by methods consisting of air-assisted spraying, airless spraying, brushing and decal transfer, cannot be considered to be a "conventional" method of application, when compared to other previously used application methods.

Applicants note that additional experimental results as shown in Figures 1 and 2 are provided with the Affidavit, in which a coupon composed of Inconel 625 is coated by a reflective coating mixture via a sputter coating. Sputter coating is an application technique used for applying a reflective coating mixture over a superalloy previous to the use of application techniques of the present invention. Further, these results show the significant reduction of reflectance properties that result from the coupon being subjected to a 1,400°F environment for only one hour. In contrast, Figure 11, which was filed in the present application and was exposed to a 1,600°F environment for 50 hours, retained a significantly improved hemispherical reflectance at the tested reflectance angle of 50 degrees. Therefore, as shown by the experimental results, there are multiple significant advantageous features provided by air-assisted spraying, airless spraying, brushing and decal transfer over superalloy materials. In sum, application of a reflective coating over superalloy materials cannot be considered to be a "conventional" method of application, when compared to other application methods.

Applicants remind the Examiner that MPEP 2145 X.D.3 entitled "Proceeding Contrary to Accepted Wisdom Is Evidence of Nonobviousness" provides that

> The totality of the prior art must be considered, and proceeding contrary to accepted wisdom in the art is evidence of nonobviousness. *In re Hedges,* 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986) (Applicant's claimed process for sulfonating diphenyl sulfone at a temperature above 127°C was contrary to accepted wisdom because the prior art as a whole suggested using lower temperatures for optimum results as evidenced by charring, decomposition, or reduced yields at higher temperatures.).
>
> Furthermore, "[k]nown disadvantages in old devices which would naturally discourage search for new inventions may be taken into account in

determining obviousness." *United States v. Adams,* 383 U.S. 39, 52, 148 USPQ 479, 484 (1966).

Additionally, the Examiner is also reminded that MPEP 2144.II.B provides

> Office personnel should consider all rebuttal arguments and evidence presented by applicants. See, e.g., *In re Soni*, 54 F.3d 746, 750, 34 USPQ2d 1684, 1687 (Fed. Cir. 1995) (error not to consider evidence presented in the specification). *C.f., In re Alton*, 76 F.3d 1168, 37 USPQ2d 1578 (Fed. Cir. 1996) (error not to consider factual evidence submitted to counter a 35 U.S.C. 112 rejection); *In re Beattie*, 974 F.2d 1309, 1313, 24 USPQ2d 1040, 1042-43 (Fed. Cir. 1992) (Office personnel should consider declarations from those skilled in the art praising the claimed invention and opining that the art teaches away from the invention.); *Piasecki,* 745 F.2d at 1472, 223 USPQ at 788 ("[Rebuttal evidence] may relate to any of the *Graham* factors including the so-called secondary considerations."). Rebuttal evidence may include evidence of "secondary considerations," such as "commercial success, long felt but unsolved needs, [and] failure of others." *Graham v. John Deere Co.*, 383 U.S. at 17, 148 USPQ at 467. See also, e.g., *In re Piasecki*, 745 F.2d 1468, 1473, 223 USPQ 785, 788 (Fed. Cir. 1984) (commercial success). Rebuttal evidence may also include evidence that the claimed invention yields unexpectedly improved properties or properties not present in the prior art. Rebuttal evidence may consist of a showing that the claimed compound possesses unexpected properties. *Dillon*, 919 F.2d at 69293, 16 USPQ2d at 1901.

(emphasis added)

Each of the first two observations in the Declaration under 37 C.F.R. §1.132 identify differences in durability and/or temperature magnitude associated with air-assisted spraying, airless spraying, brushing and decal transfer over other methods of application. In addition, the next two observations in the Declaration note specific abilities of a reflective coating applied over a titanium material to pass certain test procedures used to measure for stress corrosion cracking in the titanium material, which other application methods cannot achieve.

Therefore, by virtue of the multiple significant advantageous features provided by air-assisted spraying, airless spraying, brushing and decal transfer over superalloy or titanium materials, which identifies the previous inability in the art to successfully apply a reflective coating over titanium materials by other application techniques, application of a reflective

coating over superalloy or titanium materials cannot be considered to be a "conventional" method of application, when compared to other application methods.

Applicants would like to respond to the Examiner's statements contained in the Response to Arguments: (see page 3 of the outstanding Office Action)

> The applicant argues against the Nagaraj reference stating that since Nagaraj discloses applying a TBC by method outside the scope of the invention and only discloses 'conventional deposition techniques" for the reflective coating, such techniques logically being the same. The examiner respectfully disagrees that the teachings of Nagaraj naturally flow that the apparatus and method for coating for the two subsequent coatings are "logically" the same and cannot find evidence to suggest such. [Applicants'] arguments must be considered mere attorney speculation not supported by evidence. *In re Scarborough,* 500 F.2d 560,566 182 USPQ 298,302 (CCPA 1974).

In re Scarborough relates to arguments posed regarding a rejection under 37 C.F.R. §112, first paragraph rejection, which the Applicant in that case had the burden of showing enablement of the invention, while in the present application, Applicants' argument is directed to a 37 C.F.R. §103 rejection. Further, unlike In re Scarborough, Applicants' remarks are not mere speculation. The Examiner apparently disregarded the paragraph following the paragraph containing the "logically the same" discussion in response to the previous office action. This paragraph appears on page 11 of this Response. Applicants' basis for the "logical" remark is based on the presumed similarity between a ceramic coating which is explicitly identified in the present invention as preferably being applied by air-assisted spraying, airless spraying, brushing and decal transfer methods, and the barrier layer in Nagaraj, which also is a ceramic coating. As such, Applicants' remark is not mere speculation. Not only has the Examiner reached the conclusion without suggestion in the references themselves, which is impermissible hindsight reasoning, but in fact is taught away by the enclosed Declaration under C.F.R.§1.132, that indicates air-assisted spraying, airless spraying, brushing and decal transfer cannot be considered "conventional" application techniques.

Klabunde, as understood, teaches "spraying or dripping" (col. 6, line 33), but has no teaching of any of the recited techniques. Klabunde also has no teaching of the use of his

approach with a "reflective-coating mixture" as claimed. No disclosure, teaching or suggestion by the disclosed references indicates that palladium, platinum, and/or gold colloidal metal dispersions as taught by Klabunde will yield a "reflective-coating mixture" as claimed, and Klabunde has no teaching that they do.

As to the Kirk-Othmer publication, Applicants respectfully traverse the Examiner's contention that the Kirk-Othmer publication teaches coating a gas turbine engine. The Kirk-Othmer publication, as understood, does appear to identify air-assisted and other atomizer spraying techniques and identify some of their commercial uses. However, Applicants would like to point out that the context of the Kirk-Othmer publication, at least with respect to gas turbine engines, is clearly not that of the present invention. That is, for gas turbines, the Kirk-Othmer publication states "[f]or example, there is a growing concern over pollutant emissions from aircraft and automotive engines that utilize atomizers." See page 670. In other words, the spraying techniques cited in this publication with respect to atomizers appears directed to the internal workings of the gas turbine, i.e., the injection of fuel inside the engine for combustion, not applying a coating to the surface of a gas turbine engine. In addition, this publication fails to teach that heat-reflective coatings can be applied by spraying techniques. Therefore, the Kirk-Othmer publication cannot form the basis for concluding that spraying a heat-reflective coating onto a gas turbine engine is obvious due to the expectation of successfully forming the reflective layer as the Examiner suggests. Further, due to the different context of use of the spray as disclosed in the Kirk-Othmer publication, the Kirk-Othmer publication is not combinable with the other references in an attempt to yield Applicant's invention.

In view of the above, the Examiner, in his Response to Arguments on pages 2-3 states:

> The applicant argues against the Kirk-Othmer publication stating that the context of the Kirk-Othmer reference is directed toward internal workings of gas turbine engine and fails to teach heat-reflective coatings can be applied by spraying techniques. The examiner respectfully disagrees. The Kirk-Othmer publication, as a whole, is directed to known and conventional spraying techniques and discloses, on page 688 in Table 2, air-atomizing sprays is a known method of spraying coatings. Therefore, the Kirk-Othmer publication, reasonably suggests to one of ordinary skill in the art to utilize air-assisted spraying to coat a substrate. Therefore, it would have been obvious to one of ordinary skill at the time of the invention was made to apply the heat reflective layer of Nagaraj using

> conventional spraying as taught by Klabunde and specifically the conventional air-assisted spraying as disclosed by Kirk-Othmer because of the expectation of successfully applying the heat reflective layer coating on substrate.

First of all, the Examiner has mischaracterized Applicants' response to the Examiner's first Office Action (page 6) stating:

> Nagaraj et al. in view of Klabunde does not teach the spraying is an air assisted spraying technique. However, using air to atomize and project a spray for coating a gas turbine engine is well established in the art, as shown by Kirk-Othmer (see page 672, Table 1, page 688, Table 2), and hence would have been an obvious method of spraying the heat-reflective coating because of the expectation of successfully forming the reflective layer.

Applicants had pointed out, as previously stated, that the Kirk-Othmer publication in fact does not show that it is well established in the art to use air to atomize and project a spray for coating a gas turbine engine, only that certain types of atomizers are used by internal components within gas turbines that have to do with the operation of fuel injection, not spray coatings. Applicants note the Examiner's clarification of Kirk-Othmer, i.e., that the Kirk-Othmer publication, as a whole, is directed to known and conventional spraying techniques, disclosing air-atomizing sprays as a known method of spraying coatings, noting again that the reference to gas turbine engines refer to internal components within gas turbines. However, Applicants assert that the purpose of Kirk-Othman is not to oxidize/combust the coating material. Even if Kirk-Othmer reasonably suggests that air-assisted spraying is available for the applications identified therein while Applicant contends it does not, Kirk-Othman does not disclose or suggest that any methods for coatings applied to the surface of a gas turbine engine. That is, a reflective coating mixture as recited in independent claim 1.

Moreover, Applicants strongly disagree that even if Kirk-Othmer taught or suggested that air-assisted spraying can be applied to the surface of a gas turbine engine, which it does not, that it would have been obvious to one of ordinary skill at the time of the invention was made to apply the heat reflective layer of Nagaraj et al. using conventional spraying as taught by Klabunde and specifically the conventional air-assisted spraying as disclosed by Kirk-Othmer

because of the expectation of successfully applying the heat reflective layer coating on substrate. First of all, as discussed above, Nagaraj et al., does not disclose or suggest any methods for applying a reflective coating, and discloses methods of applying the diffusion layer that are specifically outside the scope of the present invention, thereby teaching away from the present invention as discussed previously. Moreover, Klabunde has no teaching of any of the recited techniques. Klabunde also has no teaching of the use of his approach with a "reflective-coating mixture" as claimed. No disclosure, teaching or suggestion by the disclosed reference indicates that palladium, platinum, and/or gold colloidal metal dispersions as taught by Klabunde will yield a "reflective-coating mixture" as claimed, and Klabunde has no teaching that they do. Finally, Kirk-Othmer does not teach or suggest applying an air assisted coating, or any coating for that matter, that is applied to the outside surface of a gas turbine engine component. Therefore, even if these references were to be combined, they would not yield Applicants' invention.

Furthermore, "[t]he mere fact that references <u>can</u> be combined or modified does not render the resultant combination obvious unless the prior art suggests the desirability of the combination." *See* Manual of Patent Examining Procedure, 8th Edition (MPEP), Section 2143.01.

The Examiner is reminded that "[i]f the proposed modification or combination of the prior art would change the principle or operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." *See* MPEP, Section 2143.01.

> To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

See Manual of Patent Examining Procedure, 8th Edition (MPEP), Section 2143.03.

Nagaraj et al. teaches application techniques that cannot be used to practice the claimed invention, and which are specifically identified above.

Therefore, for the reasons given above, independent claim 1 is believed to be distinguishable from Nagaraj et al., Klabunde and Kirk-Othmer and therefore are not anticipated nor rendered obvious by Nagaraj et al., Klabunde and Kirk-Othmer.

Dependent claims 2, 4, 6-10 and 12-13 are believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claims 2, 4, 6-10 and 12-13 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 2, 4, 6-10 and 12-13 are neither anticipated nor rendered obvious by Nagaraj et al., Klabunde and Kirk-Othmer and are therefore allowable.

B. Claims 3 and 5

The Examiner rejected claims 3 and 5 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer as applied to claim 1, and further in view of Driver (Great Britain Patent No. GB 2,060,436) hereinafter "Driver."

Specifically, the Examiner stated that

> Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach supplying a metallic gas turbine component comprising cobalt-base superalloy or titanium alloy. Nagaraj et al. teaches of a coating on a nickel-base superalloy, but suggests that other suitable high temperature materials could also be used (Column 3, lines 31-32). Driver teaches of an application of ceramic onto a turbine blade, where the coating is suitable for substrates of nickel and cobalt superalloys, stainless steel and titanium alloy.
>
> Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer to use the cobalt-based superalloy or titanium alloy suggested by Driver to provide a desirable ceramic coating to a metallic substrate because Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer teaches of applying a ceramic to a nickel-based superalloy or other high temperature materials and Driver teaches cobalt-base superalloy or titanium alloy are known in the art to be alternatives to nickel-based alloy.

The Examiner further states in the Response to Arguments: (see page 5 of the outstanding Office Action)

> The applicant has argued against the Driver reference stating that it teaches away from the present invention. The examiner respectfully disagrees. While Driver may disclose coating using different conditions, Driver is only

> utilized here as a showing that cobalt-based or titanium based alloys are known alternatives to nickel-based alloys for gas turbine engines.

Applicants respectfully traverse the rejection of claims 3 and 5 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Driver, as understood, is directed to applying a ceramic coating to certain metallic workpieces. Despite the Examiner's characterizations as to substitute materials, Driver discloses coating application methods involving heating the workpiece to 500°C and plasma spraying. See col. 1, page 1, lines 47-55. In contrast, the present claimed invention is directed to applying a reflective coating by air-assisted spraying, high volume low pressure methods, brushing and decal transfer method that are capable of being applied at ambient room temperature. See paragraphs [0014] through [0015]. Further, these methods do not limit the size of the article to be sprayed, nor do they require special chambers or other types of application apparatus that are specifically required by the application methods taught in Driver, which methods in Driver being incapable of being performed in the claimed invention. See paragraph [0014]. Therefore, Driver teaches away from the present invention.

Dependent claims 3 and 5 are believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claims 3 and 5 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 3 and 5 are neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer and Driver and are therefore allowable.

C. Claim 11

The Examiner rejected claim 11 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer as applied to claim 9, and further in view of Vakil (U.S. Patent No. 5,407,705) hereinafter "Vakil."

Specifically, the Examiner stated that

> Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach the claimed thermal barrier layer material containing lanthanum or cerium. Vakil teaches a nickel-based superalloy gas turbine engine component having a ceramic thermal barrier coating, where the coating can include cerium

(Col. 6, lines 1-25).

> It would have been obvious to one skilled in the art at the time the invention was made to use the ceramic thermal barrier coating material of Vakil, including the cerium component, in the process of Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer with the expectation of providing suitable thermal barrier properties, as shown by Vakil for nickel-based superalloy gas turbine engine components.

Applicants respectfully traverse the rejection of claim 11 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Dependent claim 11 is believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claim 11 recites further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claim 11 is neither anticipated nor rendered obvious by Nagaraj et al., Klabunde and Kirk-Othmer and Vakil and is therefore allowable.

D. Claim 14

The Examiner rejected claim 14 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer as applied to claim 9, and further in view of Eppler.

Specifically, the Examiner stated that

> Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach that the ceramic thermal barrier coating is applied by air assisted spraying. However, Eppler teaches breaking down a ceramic into fine particles and air assisted spraying them onto a substrate (Page 955, Column 3).
>
> Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer to use the air assisted spray technique suggested by Eppler to provide a desirable ceramic coating on a substrate Eppler teaches air-assisted spraying is known in the art to provide ceramic coatings onto a substrate.

The Examiner further states in the Response to Arguments: (see page 5 of the outstanding Office Action)

> The applicant has argued against the Eppler reference stating that it teaches away from the present invention because it teaches of air-assisted

> spraying within an enclosure. The examiner respectfully disagrees. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns,* 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). While paragraph [0015] of the specification discloses air-assisted spraying is not limited to certain considerations such as special chambers, this limitation is not required by claim 14, therefore "air-assisted spraying" is given its broadest reasonable interpretation. The added limitation to claim 1 only modifies the method of applying the reflective-coating mixture and therefore is not limiting to the application of the ceramic barrier coating mixture.

Applicants respectfully traverse the rejection of claim 14 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Eppler, as understood, is directed to spraying ceramic coatings. However, in the passage cited by the Examiner in Eppler, "[s]praying requires a gun, a container or feed mechanism, an impelling agent, and a properly designed hood or booth maintained under negative pressure (Ref 16)." *See* page 955, col. 3. (Emphasis added). Stated another way, spraying according to Eppler requires a special enclosure to perform. In contrast, the present invention in paragraph [0015], which refers to airless or air-assisted spraying for applying reflective coating and ceramic barrier coating, discloses that:

> Most of these other application techniques are limited as to the size of the articles that may be readily coated, because they require special chambers or other types of application apparatus. Airless or air-assisted spraying which are typically ambient room temperature processes, on the other hand, are not limited by these considerations, and therefore may be readily used on a wide variety of sizes and shapes of components.

Therefore, "spraying" according to the present invention is distinctly different than that taught by Eppler so that Eppler teaches away from the present invention. This limitation is incorporated into claim 1, wherein, in the step "applying the mixture to the outer ceramic surface by a method selected from the group consisting of air-assisted spraying, airless spraying, brushing, and decal transfer, each of the group being capable of being applied at ambient room

temperature and not requiring the component to be disposed inside a chamber having a pressure level less than ambient pressure level."

In response to the Examiner's "Response to Arguments", Applicants respectfully disagree that special chambers are not required by claim 14, since claim 14 depends on claim 9 which depends on claim 1, claim 1 specifically reciting "being capable of being applied at ambient room temperature and not requiring the component to be disposed inside a chamber having a pressure level less than ambient pressure level."

Dependent claim 14 is believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claim 14 recites further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claim 14 is neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer and Eppler and is therefore allowable.

E. Claim 15

The Examiner rejected claim 15 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer as applied to claim 1, and further in view of Demaray (U.S. Patent No. 4,676,994) hereinafter "Demaray."

Specifically, the Examiner stated that

> Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach polishing in the component prior to applying the thermal barrier coating. Demaray teaches polishing a nickel-based superalloy component prior to application of a thermal barrier layer, in order to achieve a desired surface roughness (Col. 2, line 49-Col. 3, line 5). One skilled in the art would have recognized that such polishing/roughening is conventionally used for enhancing the adhesion of subsequently applied coatings to a metal substrate.
>
> Therefore, it would have been obvious to one skilled in the art to polish the nickel-based superalloy component of Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer, prior to applying the coatings, in order to enhance the bonding of the coatings to the metal components, since polishing of superalloys prior to coating to enhance coating adhesion is disclosed by Demaray.

The Examiner further states in the Response to Arguments: (see page 6 of the outstanding Office Action)

> The applicant has argued against the Demaray reference stating that it teaches away from the present invention because it teaches different coatings as

> well as different methods of application. The examiner agrees that the ceramic coating of Demaray is a thermal barrier coating rather then a reflective coating, however, Demaray suggests, to one of ordinary skill in the art, to polish the substrate prior to coating achieves a desired surface roughness and one skilled in the art would recognize that this roughening enhances adhesion of the coating.

Applicants respectfully traverse the rejection of claim 15 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Demaray, as understood, is directed to applying ceramic coats to article substrates. While Applicants concur that the cited portion of Demaray (col. 2, line 49 through col. 3, line 5) teaches applying a ceramic coat to a substrate, Applicants also note that the ceramic coat is a thermal barrier coat, not a reflective coat. Additionally, despite the Examiner's characterization of Demaray as contained in the Response to Arguments, the ceramic material in Demaray is applied by techniques other than air-assisted spraying requiring a chamber that is subjected to a reduced atmospheric pressure, these conditions being contrary to the conditions recited claim 1, that is, applying the coating mixture to a surface of the component by a method selected from the group consisting of air-assisted spraying, airless spraying, brushing, and decal transfer, each of the group being capable of being applied at ambient room temperature and not requiring the component to be disposed inside a chamber having a pressure level less than ambient pressure level . See col. 3, line 55 through col. 5, line 30. In other words, since the present invention both teaches applying different types of coatings to substrates and applying the different types of coatings by methods than Demaray, by conditions recited in claim 1 in the present invention that cannot be used to practice Demaray, the component pre-treating of the present invention is not taught or suggested in Demaray, and in fact, teaches away from the present invention.

Dependent claim 15 is believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claim 15 recites further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claim 15 is neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer and Demaray and are therefore allowable.

F. Claim 16

The Examiner rejected claim 16 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer as applied to claim 1, and further in view of Rigney et al. (U.S. Patent No. 6,455,167) hereinafter "Rigney et al."

Specifically, the Examiner stated that

> Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach pre-oxidizing the component prior to applying the thermal barrier coating. Rigney et al. teaches oxidizing a nickel-based superalloy component of a gas turbine engine in order to enhance the bonding between the superalloy and subsequently applied coatings (Col. 1, lines 7-10; Col. 6, lines 15-40).
>
> It would have been an obvious modification, for one skilled in the art, to Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer to oxidize the nickel-based superalloy, in order to enhance the bonding between the superalloy and subsequently applied coatings, as is target by Rigney et al.

The Examiner further states in the Response to Arguments: (see page 6 of the outstanding Office Action)

> The applicant has argued against the Rigney reference stating the reference does not teach a reflective coating and therefore is not properly combinable. The examiner agrees that the ceramic coating of Rigney is a thermal barrier coating rather then a reflective coating, however, Rigney suggests, to one of ordinary skill in the art, to oxidize the substrate prior to coating enhances the bonding between the superalloy and the subsequent coating.

Applicants respectfully traverse the rejection of claim 16 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Rigney et al., as understood, is directed to coatings on superalloy substrates such as a diffusion layer applied to a substrate followed by subsequent alumina layer, followed by a ceramic topcoat. Although the ceramic topcoat may be classified as a thermal barrier coat to allow performance at higher temperatures (see col. 5, lines 21-23), a thermal barrier coat is not a reflective coat as specifically recited in the present invention. Therefore, Rigney et al. cannot be properly combined with the other references to teach providing a desired reflective-coating mixture to form a reflective coating on the ceramic component of the present invention.

Furthermore, "[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art suggests the desirability of the combination." See Manual of Patent Examining Procedure, 8th Edition (MPEP), Section 2143.01.

The Examiner is reminded that "[i]f the proposed modification or combination of the prior art would change the principle or operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." *See* MPEP, Section 2143.01.

> To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

See Manual of Patent Examining Procedure, 8th Edition (MPEP), Section 2143.03.

A reference merely teaching use of a thermal barrier coating does not suggest that a reflective coating can also be used.

Dependent claim 16 is believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claim 16 recites further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claim 16 is neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer and Rigney et al. and are therefore allowable.

G. Claims 17-18

The Examiner rejected claims 17-18 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer as applied to claim 1, and further in view of Demaray and Rigney et al.

Specifically, the Examiner stated that:

> Nagaraj et al., Klabunde, Kirk-Othmer, Demaray, and Rigney et al. are applied here for the same reasons as given above.
>
> It would have been obvious to one skilled in the art at the time the invention was made to polish and oxidize the nickel-based superalloy component

> of Nagaraj et aI. in view of Klabunde and further in view of Kirk-Othmer, prior to applying the coatings, in order to optimize the bonding of the coatings to the metal components, since both polishing and oxidizing of superalloys prior to coating are known to increase coating adhesion as disclosed by Demaray and Rigney et al. Please note that the test of obviousness is not an express suggestion of the claimed invention in any or all references, but rather what the references taken collectively would suggest to those of ordinary skill in the art presumed to be familiar with them *(In re Rosselet,* 146 USPQ 183).

Applicants respectfully traverse the rejection of claims 17-18 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde, Kirk-Othmer, Demaray and Rigney et al. are equally applicable here.

Dependent claims 17-18 are believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claims 17-18 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 17-18 are not anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer, Demaray and Rigney et al. and are therefore allowable.

H. Claims 19-20

The Examiner rejected claims 19-20 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and Kirk-Othmer as applied to claim 1, and further in view of Tecle (U.S. Patent No. 5,922,403) hereinafter "Tecle."

Specifically, the Examiner stated that

> Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach of providing a reflective-coating mixture with a noble metal encapsulator. Tecle teaches of a method for forming a palladium, silver, gold or platinum in an organic carrier (Column 3, lines 25-35). Tecle discloses utilizing an encapsulant material to limit the required amount of solvent (Column 4, lines 59-67). Tecle utilizes a metallic colloidal solution with fluxing agents to coat ceramics, metals, and ceramic/metal composites (Column 7, lines 10-31).
>
> Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Nagaraj et at. in view of Klabunde and further in view of Kirk-Othmer to use a solution containing a metal encapsulant and fluxing agent as taught by Tecle to provide a desirable metallic coating because Nagaraj et at. in view of Klabunde and further in view of Kirk-Othmer teaches using a metallic pigment in an organic solvent for coating a surface and Tecle teaches a metal encapsulant reduces the large amount of solvent required when coating a ceramic

> or metal substrate and fluxing agents are provide enhanced adherence of a coating to a substrate.

The Examiner further states in the Response to Arguments: (see page 6 of the outstanding Office Action)

> The applicant has argued against the Tecle reference stating that it fails to disclose a method of applying a solvent including an encapsulant and fluxing agents. While the examiner agrees Tecle does not explicitly teach a method of application, Tecle reasonably suggests to one of ordinary skill in the art to provide a metallic particle/organic carrier solution with encapsulants to decrease the large amount of organic material required as well as fluxing agents to enhance the promotion of the coating to the substrate.

Applicants respectfully traverse the rejection of claims 19-20 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Tecle, as understood, is directed to preparing formulations having ultrafine particles that can be placed in a solvent that encapsulates the solvent as applied. However, Tecle fails to disclose a technique for applying the solvent to an article substrate, and there is question whether the Tecle solvent can be applied by at least some of the recited application techniques due to the decreased amount of solvent contained in the Tecle suspension.

Dependent claims 19-20 are believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claims 19-20 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 19-20 are neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer and Tecle and are therefore allowable.

I. Claims 21-23

The Examiner rejected claims 21-23 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and Kirk-Othmer as applied to claim 1, and further in view of Akechi (Japanese Publication No. JP60081892A) hereinafter "Akechi."

Specifically, the Examiner stated that

Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach a reflective coating mixture containing a glass or ceramic comprising up to 25 wt% of the reflective mixture. Akechi teaches of using glass frit and noble metal dispersion in an organic vehicle to from a coating (Abstract). Akechi discloses using 1-3 wt % glass frit and 37-59 wt % noble metal powder in a 40-60 wt % organic vehicle (abstract). The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made if the overlapping portion of the range as disclosed by the reference were selected because overlapping ranges have been held to be prima facie case of obviousness. See In re Wortheim 191 USPQ 90. In addition, Akechi clearly discloses including the filler material to provide passage for gas material at time of heating, so that the gas can easily pass through the passage to the surface (Page 4). Akechi goes on to say that film bulging and film tearing due to any residual gas can be completely prevented (Page 4). In addition, Klabunde teaches a of applying a metal coating on a substrate includes forming a dispersion of metal particles and organic carrier, spraying the dispersion to the substrate, and finally heating/firing to form the metal layer (Col 3, lines 35-65; Col 6, lines 30-54). Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer and Rigney et al. to use the glass frit/noble metal in an organic vehicle taught by Akechi to reap the benefits of providing a passage of gas for residual gases in the film to completely prevent film bulging and tearing upon heating.

The Examiner also stated in the Response to Arguments, pages 5-6

The applicant has argued against the Akechi reference stating that it teaches a thick paste and not therefore cannot be applied by the coating techniques of the present invention. The examiner only utilizes Akechi as a showing that it is known in the art to provide a glass filler in a noble metal/organic carrier dispersion.

In response to applicant's argument that Akechi is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker,* 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, both the prior art and the present claims are directed to applying a metal/organic coating onto a substrate. In addition, Akechi clearly discloses including the filler material to provide passage for gas material at time of heating, so that the gas can easily pass through the passage to the surface (Page 4). Akechi goes on to say that film bulging and film tearing due to any residual gas can be completely prevented (Page 4). In addition, Klabunde teaches of applying a metal coating on a substrate includes forming a dispersion of metal

> particles and organic carrier, spraying the dispersion to the substrate, and finally heating/firing to form the metal layer (Col 3, lines 35-65; Col 6, lines 30-54). Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Nagaraj et al. in view of Klabunde and further in view of KirkOthmer and Rigney et al. to use the glass frit/noble metal in an organic vehicle taught by Akechi to reap the benefits of providing a passage of gas for residual gases in the film to completely prevent film bulging and tearing upon heating.

Applicants respectfully traverse the rejection of claims 21-23 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Akechi, as understood, is directed to a thick film paste of predetermined percentages by weight of precious metal powder, glass frit and an organic vehicle for preparing a thermal print head. Applicants note that by virtue of the Akechi material being presented in the form of a thick paste, the only identified application technique is printing, which technique is not included as any of the recited application techniques of the present invention. Additionally, Akechi is directed to thermal printing heads, which is not remotely related to reflective coatings on gas turbine engines, and is therefore non-analogous art.

In response to the Examiner's Response to Arguments, the Examiner cites In re Oetiker, which held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. Akechi is applied as a paste, not sprayed on as taught by Klabunde, so application according to the references is problematic. Further, the problem associated with film bulging and tearing in Akechi appears to be resolved by the addition of glass filler material. In the present invention, as provided in paragraph [0034], "the reflective coating formulations contain fluxes and glass formers, as well as the encapsulated noble metal which each contribute to prevent the reflective coating from diffusing into the substrate of the component at high temperature." (emphasis added) Thus, not only is Akechi not properly combinable with the other references, Akechi is not reasonably pertinent to the particular problem with which Applicants are concerned, i.e., preventing

diffusion into the substrate at high temperatures. As such, Applicants continues to respectfully disagree with the Examiner's position.

Dependent claims 21-23 are believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claims 21-23 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 21-23 are neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer, and Akechi and are therefore allowable.

J. Claims 24-26

The Examiner rejected claims 24-26 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and Kirk-Othmer, Demaray, Rigney et al. and Eppler.

Specifically, the Examiner stated that

> Nagaraj et al., Klabunde, Kirk-Othmer, Demaray, Rigney et al., Eppler are applied here for the same reasons as given above.
>
> It would have been obvious to one skilled in the art at the time the invention was made to modify Nagaraj et al. by incorporating spraying as taught by Klabunde and particularly air-assisted spraying as taught by Kirk-Othmer for turbine engine components, and further incorporate polishing and oxidizing to improve coating adhesion as taught by Demaray and Rigney et al. and to air assist spray the ceramic layer as taught by Eppler because the combination of the references provides known and conventional steps in coating a turbine component to maximize properties and coating adhesion.

Applicants respectfully traverse the rejection of claims 24-26 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde, Kirk-Othmer, Demaray, Rigney et al. and Eppler are equally applicable here.

Claim 24 recites a method of applying a heat-rejection coating, comprising the steps of: supplying a metallic component of a gas turbine engine, the component comprising a nickel-base superalloy and having a component surface; pre-treating the component surface; thereafter air-assisted spraying a reflective-coating mixture onto the pre-treated component surface, the reflective-coating mixture comprising a metallic pigment and a reflective-coating-mixture carrier; and firing the component surface having the coating mixture thereon. (Emphasis added).

Therefore, for the reasons previously given for independent claim 1 above, independent claim 24 is believed to be distinguishable from Nagaraj et al., Klabunde, Kirk-Othmer, Demaray, Rigney et al. and Eppler and therefore are not anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer, Demaray, Rigney et al. and Eppler.

Dependent claims 25-26 are believed to be allowable as depending from what is believed to be allowable independent claim 24 for the reasons given above. In addition, claims 25-26 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 25-26 are neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer, Demaray, Rigney et al. and Eppler and are therefore allowable.

CONCLUSION

Applicants request the entry of the present amendment and the withdrawal of the rejection of claims 1-26. Alternatively, Applicants request entry of the amendment to clarify the claims on appeal. Based on the amendments to the claims, Applicants further request allowance of claims 1-26, and issuance of the application as amended. A timely and favorable action is earnestly solicited.

The Commissioner is hereby authorized to charge any additional fees and credit any overpayments to Deposit Account No. 50-1059.

Respectfully submitted,
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